

REMARKS

In an Official Action dated April 11, 2008, the Examiner rejected claims 1-8 as anticipated Nippert 6,651,545 and claims 9-10 as obvious over Nippert '545 in combination with Salter 5,259,738. Applicants request that the Examiner reconsider the rejections in light of the following discussion.

In Applicants' device, each chamber is operable in three different modes: (1) an idling mode, in which none of its usable volume is used, (2) a partial mode using only part of its usable volume and (3) a full mode using all of its usable volume. A further 'partial' mode is achieved because the electronic sequencing means is arranged to select the mode of each chamber on successive cycles so as to vary the time averaged effective flow rate of fluid through the machine.

Nippert discloses two different partial modes for the pump as a whole. In the mode described at column 8 lines 26 to 42, one or more of the cylinders is in an idling mode. In a separate mode described at column 8, lines 43 to 52, one or more of the cylinders is in a partial mode, effectively pumping only a portion of the total volume of fluid. The partial mode is achieved by opening (and optionally re-closing) the valve in the pumping stroke (column 8, lines 43-52), which necessarily means opening the valve against pressure within the cylinder.

In Nippert a decision is made to either (a) place one or more specific cylinders in idling mode or (b) place one or more cylinders in partial mode. Operation then continues until the displacement is varied by the controller. In contrast to the examiner's assertion, Nippert does not describe at column 7 lines 3-12 nor anywhere else that the mode of each chamber is selected **on successive cycles** so as to vary the time averaged effective flow rate, only that certain of the working chambers can be disabled. Indeed, Nippert describes the idling of certain cylinders as being achieved by "**continuously** holding the ball check valve 72 of the second valving assembly 66 in a position between the first and second valve seats 68,70" [emphasis added]. This will

only provide certain quantised steps of fluid displacement per revolution in the case of the mode where cylinders are idle or used to their full extent, the steps being directly related to the number of cylinders.

In Applicants' device, the electronic sequencing controller selects the mode of each chamber on successive cycles so as to vary the time averaged flow rate through the machine. In other words, a decision is taken on a stroke-by-stroke basis whether to operate the chamber in a full, partial or idling mode. Nippert at el does not even disclose operation with some cylinders in partial mode and others in idling mode, let alone the determination of each cylinder's mode on a stroke-by-stroke basis.

Whereas the machine of Nippert can achieve an unquantised variable output flow by opening the valves against pressure at different angles (column 8, lines 43-52), in Applicants' device it is the changing of the pumping volume **on each successive cycle of each cylinder** that provides it with the same ability to vary the **time averaged flow** (as compared to the flow coming from a single working chamber). Indeed, in the present application it is preferred that the partial cycles are of a fixed size.

Furthermore, in Applicants' device, the simple, un-piloted, poppet low pressure valve is not operable to open against pressure and therefore cannot open once closed during pumping or motoring, until the movement of the cam allows the pressure within the working chamber to fall. On the other hand, Nippert explicitly states that the valves in use are openable in mid cycle (column 8, line 45-50), which must necessarily be to open against pressure in the cylinder. They therefore either require a pilot stage (column 9, lines 8-20) or a strong electric actuator. Also, the valves required to operate the machine of Nippert have two operative (closed) positions and a neutral (open) position (column 8, line 50), whereas the valves employed in Applicants' device are simplified to have a neutral (open) position and a single operative (closed) position. Therefore the valves employed in Applicants' device are seen to be much simpler and therefore cheaper and more reliable, or to consume less energy in their actuation, than

the valves employed by Nippert. Since Nippert's machine does not vary the time averaged flow by selecting working chambers to be used in the full, partial or idle mode on a cycle by cycle basis, Nippert incorporates expensive and complex valves.

Applicants' device provides a continuously controllable, open-loop, output flow (either positive or negative). An example of the operation of the present machine is described at page 7, line 30 to page 8, line 16 of the present application and, as mentioned there, this provides smooth and accurate flow control.

Since Nippert does not teach or suggest an electronic sequencing controller arranged to select the mode of each chamber on successive cycles so as to vary the time averaged effective flow rate of fluid through the machine, Nippert does not anticipate claim 1. Therefore, Applicant requests that the Examiner reconsider the rejection of claim 1 and dependent claims 2-10.

In light of the foregoing, Applicant believes this case is in form for allowance. If the Examiner believes that any issues remain regarding the allowability of the application, the Examiner is requested to contact Applicants' undersigned attorney to rectify any outstanding issues.

Respectfully submitted,

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